Test 1
Statistical Methods I
Fall 2001

Name:………………………………………………………………

Problem #1

Y = Hardness
X = Time
Assume the normal error regression model.

1 Fit the model $E(Y) = b_0 + b_1 X$.

2 Evaluate s^2.

3 Evaluate e when X = 10.

4 Test $H_0: b_1 = 1.85$ Vs $H_a: b_1 \neq 1.85$.

5 Construct a 95% confidence interval for b_0.

6 Construct a 90% confidence interval for $E(Y_h)$ when X_h =60.

7 Find a 90% prediction interval for a new observation when time equals 60.

8 Comment on the residual plot.

9 Comment on the normal probability plot.

10 Conduct the correlation test for normality.

11 Conduct the Shapiro-Wilks test for normality.

12 Conduct the modified Levene test for constant error variance.

13 Conduct a Breusch-Pagen test for constant error variance.

14 Fit the model $E(Y) = b_0 + b_1 X + b_2 X^2$.

15 Test $H_0: b_2 = 0$ Vs $H_a: b_2 \neq 0$.

16 Do a lack-of-fit test.

17 Construct a 90% simultaneous confidence interval for b_0 and b_1 using the model in part 14.

18 Write down the SAS codes to generate the attached output. (Sorry)

Problem #2

Consider the model $E(Y) = b_0 + b_1 X$.

Data:

Y	X
5	1
8	2
11	1
13	2

(a) Find the X matrix.

(b) Find the vector b .

(c) Find the hat matrix.

(d) Find the vector $\hat{Y}$.

(e) Find the vector $\hat{e}$.

(f) Transform the independent variable as $Z = \dfrac{X - \bar{X}}{0.5}$.

Data:

Y	Z
5	___
8	___
11	___
13	___

(i) Find the new X matrix.
(ii) Find the new hat matrix.
(iii) Find the vector $\hat{Y}$ (after transformation).
(iv) Find the vector $\hat{e}$ (after transformation).

(g) Comment on the hat matrix, $\hat{Y}$, and $\hat{e}$ before and after transformation. What are the implications of this result?